

The origins of mental contamination

Article

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Abstract

Background

The origins of contamination fears are unknown although this might enhance interventions.

Method

Thirty people with OCD and contamination fears were interviewed about experiences involving direct, vicarious and informational learning routes.

Results

29 reported contact contamination was, 17 mental contamination and 6 morphing fears. Mental contamination fears start around a mean of 15.5 years ($SD=7.8$). Contact contamination preceded mental contamination in 9 cases, four described simultaneous onset, and two participants reported mental contamination first. Thirteen participants with mental contamination (76.5%) recalled a direct learning experience, often immoral acts, prior to symptom development. Three participants with mental contamination fears reported receiving threatening information. Of the 6, Three participants with morphing fears described a direct learning experience, the same proportion reported an occasion when they received threatening information, and one provided an example of a vicarious learning event.

Conclusion

Contact contamination tends to precede mental contamination and is associated with specific incidents. Mental contamination precedent events often involved immoral acts in which the person was the victim or perpetrator. This study is limited by a small sample size and retrospective method but provides an initial understanding of the origins of mental contamination.

Keywords

Mental Contamination; Morphing Fears; Learning; Development;

Introduction

A number of aetiological models have been proposed regarding the origins of fears and phobias and their role in the development of human psychopathology. These fall into two overarching categories - non-associative and associative explanations of fear onset. Non-associative models posit that fears are biologically determined and may stem from genetic, neuroanatomical and/or neurophysiological roots (Poulton & Menzies, 2002). Such models propose that evolutionarily-relevant fears are innate and non-specific stressors (e.g. traumatic or stressful life events) may potentiate fears. In contrast, associative models posit that there are three pathways to the acquisition of fear (Rachman, 1977): (1) direct learning (e.g. an encounter with a painful or fear-evoking stimulus or event); (2) vicarious/observational learning (e.g. following modelling or observational learning), and; (3) informational/instructional (e.g. through transmission of instruction of fear-inducing information) experiences.

Support for the role of learning experiences in fear development has been found in retrospective studies in which people with various specific fears attributed their onset to direct learning events (Duff & Brownlee, 1999; McNally & Steketee, 1985; Merckelbach, Muris, & Schouten, 1996; Öst & Hugdahl, 1981; Rimm, Janda, Lancaster, Nahl, & Dittmar, 1977), observational learning (Bandura, Blanchard, & Ritter, 1969; Bernstein, Kleinknecht, & Alexander, 1979; King, Clowes-Hollins & Ollendick, 1997; Merckelbach, van den Hout, Hoekstra, & De Ruiter 1989; Milgrom, Mancl, King, & Weinstein, 1995), and receiving negative information or instruction (Kleinknecht, 1982; Merckelbach et al., 1989; Muris, Merckelbach, & Collaris; 1997b; Ollendick & King; 1991; Rimm et al., 1977).

With regards to OCD, only two retrospective studies have investigated the relevance of learning in the development of contamination fears. Jones and Menzies (1998) developed the OCD Origins Questionnaire (OOQ) and Origins Interview to examine the determinants of OCD washing concerns and classify these into onset types. They found that OC washing was attributed to prior learning events in only 3 of the 23 cases investigated, with no differences between the number of negative learning events experienced by those with and without washing compulsions. Indeed, contrary to expectation, significantly more non-OCD subjects had experienced vicarious learning events related to dirt and washing than OCD subjects. In a subsequent study, only 5 out of 19 people with compulsive washing reported a history of associative learning (Krochmalik, Jones and Menzies, 2007).

At the time the previous studies were conducted, the concept of ‘mental contamination’ was in its infancy with only one paper published on ‘mental pollution’ having the concept as its focus (Rachman, 1994). Mental contamination can be considered as feelings of dirtiness or pollution that arise in the absence of physical contact with a tangible stimulus. Mental contamination can be divided into different subtypes, one of which is the fear of morphing (Rachman, 2006). The fear of morphing (also known as transformation obsessions) involves concern that the person may become contaminated by, and acquire, characteristics of others (Zysk, Shafran, Williams and Melli, 2015). Intrinsic to the construct of mental contamination (Rachman et al., 2013) is the hypothesis that negative past experiences, particularly those involving a moral violation (such as a betrayal, humiliation, or sexual, physical or emotional harm) play a critical role but so far this hypothesis has not been tested; furthermore, it has not been elucidated whether these negative experiences involve learning pathways or are consequences of unrelated stressful life events.

The primary aims of this retrospective study was to investigate the (1) age of onset of mental contamination, (2) relationship between onset of mental and contact contamination, (3) frequency of learning experiences before the development of contamination fears, and (4) people’s believed origins of their fears. While morphing fear is conceptualised as a subtype of mental contamination in accordance with theory (Rachman et al., 2006), it has been the subject of independent study in paediatric populations (Monzani, Jassi, Heyman, Turner, Volz & Krebs, 2015; Volz and Heyman, 2007) so was considered separately.

It was hypothesised that the learning pathways described by Rachman (1977) would be the most commonly reported determinants of contact and mental contamination, and of these, the direct pathway would be the most attributed route in fear acquisition. These hypotheses were formulated based on theory (Rachman, 1977) and previous retrospective research in phobias (e.g. King, Eleonora, & Ollendick, 1998; Merckelbach, de Jong, Muris, & van Den Hout, 1996; Merckelbach et al., 1989; Muris, 2007; Ollendick & King, 1991; Öst & Hugdahl, 1981; Krochmalik et al., 2007). No specific hypotheses were made with regard to the age of onset of mental contamination or whether contact contamination would be likely to precede mental contamination or vice-versa.

Methods

Design: This study was one part of a larger project. The research comprised interlinked studies that included online measures (Stage 1) and an assessment interview (Stage 2).

Ethical approval was granted by the NHS (10/H0505/61) and University research ethics committees.

Participants: As part of a questionnaire study, convenience clinical and non-clinical samples ($n=978$) completed measures including the Morphing Fear Questionnaire (MFQ, Zysk et al., 2016), Obsessive-Compulsive Inventory Revised (OCI-R, Foa et al., 2002), and Vancouver Obsessive-Compulsive Inventory – Mental Contamination (VOCI-MC, Rachman, 2006). Respondents who met the inclusion criteria and consented to further contact were invited to participate in this interview study. Based on previous studies (e.g. Coughtrey, Shafran, Knibbs & Rachman, 2012), inclusion criteria included having: (a) a total score of 5 or above or at least one score of 4 on the OCI-R washing subscale, (b) a total score of 40 or above on the VOCI-MC Scale, and/or (c) a total score of 11 or above on the original version of the MFQ or a score of 3 or above on at least 2 items on the MFQ.

Thirty-seven people who were eligible for this study agreed to participate in the interview; 32 met diagnostic criteria for OCD, as confirmed by the ADIS-IV. Of these, 30 had contamination fears in this study. One participant reported difficulties in processing information and was unable to answer the multidimensional forced-choice pathways question. Participants ranged from 18 to 51 years ($M=33.1$, $SD=10.1$), and 53.3% were women. Twenty-nine people identified themselves as white, and one as mixed ethnicity. Participants in this study presented with mild to severe OCD (as assessed by the ADIS), with a mean Y-BOCS score of 25.5 ($SD=6.3$) which fell in the severe range (Stanford School of Medicine, 2010). Twenty-six participants were found to suffer with between 1 and 6 co-morbid disorders, most commonly generalised anxiety, social anxiety, depression, panic disorder, agoraphobia, health anxiety and PTSD. From those assessed, 65.5% reported receiving current treatment for OCD (27.6% psychotropic, 17.2% non-pharmacological, 20.7% combination), and 24.1% had received treatment in the past (0% psychotropic, 13.8% non-pharmacological, 10.3% combination) but were not under any care at the time of the interview.

Materials

Morphing Fear Questionnaire (MFQ; Zysket al., 2015). This highly reliable (Cronbach's $\alpha = 0.81-.90$) self-report measure assesses for morphing beliefs and fears. Respondents rate to

what extent they agree with items (e.g. worry I can magically be transformed into someone or something else' using a 0–4 scale (“Not at all” to “Very Much”).

Obsessional Compulsive Inventory Short Version (OCI-R; Foa et al., 2002). The OCI-R is designed to assess OCD symptomatology and severity using 6 subscales: washing, obsessing, hoarding, ordering and neutralising. It comprises 18 items rated on a 5-point Likert scale (0–4). The washing subscale has shown high internal consistency (Cronbach's $\alpha = .86$) and test-retest reliability ($r_s = .86$) in an OC sample, and evidenced convergent validity with Rachman & Hodgson's (1980) MOCI ($r_s = .78$) (Foa et al., 2002).

Vancouver Obsessional Compulsive Inventory–Mental Contamination (VOCI-MC, Rachman, 2006). This measure consists of 20 items assessing different aspects of mental contamination e.g., “I often feel dirty under my skin”. The VOCI-MC has high internal consistency (α range = 0.93–0.97, Radomsky et al. 2014). All items are rated on a 5-point Likert scale (0–4).

The Anxiety Disorders Interview Schedule (ADIS–IV; Brown, Di Nardo, & Barlow, 1994). This is a widely used semi-structured diagnostic interview with excellent psychometric properties. It assesses current episodes of mental health disorders such as anxiety and depression in accord with DSM–IV criteria (American Psychiatric Association, 1994).

Yale–Brown Obsessive Compulsive Scale (Y–BOCS; Goodman et al., 1989a). The Y–BOCS is a semi-structured interview. It employs a checklist to assess the nature of the disorder and a 10-item 0–4 Likert scale to measure the severity of obsessions and compulsions. It has established excellent reliability and validity (Goodman et al., 1989a, 1989b).

Standardized Interview Schedule—Contamination (Shortened Version) (Rachman, 2006). This interview assesses for the presence and features of contact and mental contamination, with two questions specifically assessing for the presence of morphing fears.

Origins of Contamination Fears Interview (Zysk & Shafran, unpublished). This semi-structured interview was created for this study to investigate people's beliefs about the genesis of their contamination fears: contact contamination, mental contamination, and morphing fears. Participants were asked to provide examples for areas they endorsed to be problematic, and were asked about frequency and interference of these symptoms and their resultant distress. The age of onset of each symptom type was ascertained and participants were asked to recall their first negative experience prior to this age for the relevant area of

concern. Experiences involving negative direct, vicarious and informational learning routes were investigated.

The interview was designed to take into account all possible beliefs about causes or triggering factors in the onset of each of the contamination fears and give equal consideration to each of the possible aetiological pathways. Participants were interviewed about associative and non-associative experiences, stressful life events and general stress prior to symptom onset in addition to being asked to consider biological influences, the role of temperament, and any other beliefs they may hold about their fear onset. Following consideration of all possible determinants to contamination fears, participants were asked which they believe to be most relevant in the genesis of their own contact contamination, mental contamination and/or morphing fears.

Procedure

The presence of contact contamination concerns was determined based on the ADIS-IV, Y-BOCS and Standardized Interview Schedule for Contamination interviews. The presence of mental contamination was determined chiefly by the Standardized Interview Schedule and VOCI-MC scale; in cases where it was uncertain if a patient had a particular concern he or she was asked to provide examples of highly rated items on the VOCI-MC scale. The presence of morphing fears was determined by questions on the Standardized Interview Schedule for Contamination and by asking participants to elaborate on highly rated items of the MFQ. Participants presenting with any of the three contamination concerns were administered the Origins of Contamination Interview. All interviews were carried out by a single assessor (the second author) and lasted approximately 2-4 hours. Participants were thanked for their time, they were fully informed about the purpose of the study.

Results

Descriptive Statistics

Contamination Types

The most common form of contamination was contact contamination ($n=29$, 52% female). Seventeen participants (57%) were found to have current mental contamination (65% female, mean VOCI-MC score =22.67, $SD=12.50$) and six (20%) had morphing fears (83% female,

mean MFQ score =26.2, $SD=13.2$). Table 1 shows the ages and scores of the various measures used. A multivariate analysis of variance comparing those with contact contamination concerns alone against those participants with contact and mental contamination concern was statistically significant $F(4,21) = 7.54, p = 0.001, \eta^2 = 0.59$). The multivariate F was due to significantly higher scores from those reporting mental contamination concerns on the VOCI-MC ($F(1,24) = 21.86, p < 0.001$), higher OCI-R ($F(1,24) = 6.24, p=0.02$) and morphing fears questionnaire ($F(1,24) = 33.05, p < 0.001$), but no difference on the interview measure of OCD severity (Y-BOCS). Figure 1 depicts the overlap of fears and demonstrates the degree of overlap in the groups.

__ Please insert table 1 and Figure 1 about here __

Age of Mental Contamination Fear Onset

The age of symptom onset was reported to have been 5.5–35 years for mental contamination ($M=15.5, SD=7.8$), between 6 and 39 years for contact contamination ($M=14.0, SD=7.9$), and 8–35 years for morphing fears ($M=19.0, SD=8.5$).

Temporal sequence of onset of contact and mental contamination

For those experiencing both contact and mental contamination, acquisition of contact contamination preceded mental contamination in 9 cases (mean years between onset =9.8, $SD=7.5$), four accounts were of a simultaneous onset, and two participants reported mental contamination preceding contact contamination fears (years in between onset were 2 and 2.5). In the five participants who had both mental contamination and morphing fears, development of morphing fears followed the onset of mental contamination, ranging from 2 to 12.5 years and averaging 7.3 years ($SD=4.7$) between symptom onset. The one participant who in addition to morphing fears had contact contamination but not mental contamination reported morphing fears to have surfaced half a year after her acquisition of contact contamination.

Learning experiences

Table 2 reports the proportion of participants who described learning events for each of the contamination fear types, shown by the type and number of types of learning experiences

reported. The large majority of participants (86.2%) reported at least one learning event prior to contact contamination symptom onset, with 34.5% reporting all three. Three-quarters (76.5%) of participants with mental contamination and half of participants with morphing fears could also recall at least one learning experience before symptom development. These included immoral acts such as a partner being unfaithful, being bullied, and being wrongly accused of rape.

At least one example within each of the learning categories was reported by the majority of people suffering with contact contamination prior to symptom onset, with 58.6% reporting having had a direct negative experience, 58.6% a vicarious experience, and 69.0% having received information or specific instructions about potential contaminants. Three-quarters (76.5%) of participants with mental contamination described a past negative direct learning experience, none reported witnessing or believing they were witnessing others experiencing these symptoms, and 17.6% reported receiving relevant information. Of the 6 participants with morphing fears, three described a direct experience, the same proportion reported an occasion when they received threatening information, and one provided an example of a past vicarious event.

Please insert Table 2 here

A series of binomial tests revealed that there were significantly more people with contact contamination who reported relevant learning events than those who did not [$z=3.71$, $p(\text{one-tailed})<.001$], and a non-significant difference between those with and without learning experiences [$z=1.94$, $p(\text{one-tailed})=.075$] in the mental contamination sample. Similar proportions of those with morphing fears with and without previous learning experiences were also found [$p(\text{two-tailed})=1.00^1$]. The reported p values were Bonferroni adjusted to account for 3 tests.

¹ A z -score is not provided as the low sample size violates the assumption of a binomial test.

Table 3 presents the average number of experiences reported per person suffering with each of the contamination types and the total number of events recalled by all participants, the number of people reporting learning and other experiences, and the range of the number of events recalled. For comparison, the numbers of other (non-associative) experiences offered by participants for each of the contamination types are additionally provided in the table.

Please insert Table 3 here

On average, 10.5 contamination related learning events were described per person interviewed.

Other Major Events and Stressors preceding onset of contamination fears

Thirteen of the 29 people interviewed reported experiencing stress prior to or at the time of contamination symptom onset, and of these people, the mean number of stressors reported was 1.9. Commonly reported stressors included school/university stress (n=10), romantic relationship problems (n=4), family conflict or stress (n=3), parental discord or divorce (n=2), loss of family member (n=2), family illness (n=2), moving house (n=2), depression (n=2), and bullying (n=2). Unique stressors included sexual abuse, lack of emotional closeness, travel, pregnancy, miscarriage, medical condition, medical treatment, loss of a friendship, lack of sleep, social stressors, loss of job, lack of housing, and distressing (non-contamination-related) intrusions.

Discussion

The age of contamination fear acquisition was found to vary greatly across the lifespan (5.5–39 years). Based on both the median and mean ages, contact contamination fears developed earliest in life (young adolescence) while morphing fears surfaced the latest (young adulthood). In 9 of the 15 participants with both mental and contact contamination, the contact contamination was reported to have emerged first. Assessing for the age of onset of each of the fear types helped answer Rachman's (2006) question with regard to contact and mental contamination: "Which comes first, and what is the lag between the development of

the first form and the second form of contamination?” (p. 55). This study adds to previous evidence that mental contamination can develop prior to and exist in the absence of contact contamination (cf. Rachman, 2006; Coughtrey et al., 2012). Given that 5 of the 6 participants with morphing fears had mental contamination fears prior to the development of morphing, the value of considering morphing fears as a separate subtype of mental contamination warrants exploration.

There was support for the hypothesis that participants would attribute the onset of their contamination fears to the learning pathways described by Rachman (1977) with 66.7% of participants endorsing an associative account of the origins of their mental contamination and 71.4% endorsing an associative account of their contact contamination. Contamination-related learning events were reported by the large majority of the sample (93.5%). Despite the likelihood of failing to recall important learning events which may account for fear onset (Graham & Gaffan, 1997; Menzies & Clarke, 1993a, 1994, 1995b; Öst & Hugdahl, 1981), and an unwillingness to disclose certain information, participants on average described 4.0 learning events each. The greatest number of learning experiences reported was direct and the fewest was of vicarious reports with over three-quarters of those with mental contamination reporting feelings of dirtiness which had arisen following a negative direct learning event prior to the onset of their concerns. The findings are consistent with the clinical observation that the histories of patients with mental contamination commonly involved immoral acts of which patients were the victim or perpetrator (Rachman, Radomsky, Elliot & Zysk, 2012) and 6 of the 17 participants with mental contamination spontaneously mentioned episodes of bullying.

It was not surprising that none of the affected participants believed to have witnessed someone else experiencing mental contamination. Firstly, mental contamination involves a non-tangible trigger which may not be outwardly apparent, and an observer would be likely to ascribe any fearful or avoidant responses or washing behaviours to conventional triggers. Secondly, mental contamination results in internal feelings of pollution, and without witnessing evident cleaning attempts an observer may not detect the afflicted person's concerns. In addition, OCD sufferers often hide their symptoms (Newth & Rachman, 2001; Torres et al., 2006) and may perform washing compulsions in private. Thirdly, patients may not recognise the source of their contamination, or may ascribe their fears and cleaning

attempts to other causes when explaining their symptoms as the concept of a non-physical contaminant is inherently perplexing. While feelings of mental contamination may not be as uncommon as previously speculated, feelings of dirtiness or moral pollution which result from a non-physical means do not appear to be universally recognised outside the academic and clinical realm, and people with mental contamination are commonly unaware of the non-physical cause of their contamination. Similarly, only two participants considered the information they received prior to their symptoms as most aetiologically influential in their mental contamination concerns.

The non-associative perspective was not supported in this study. Firstly, in contrast with the higher frequencies reported in previous studies (e.g. Jones & Menzies, 1995, 1998a; Menzies & Clarke, 1993b, 1995b) none of the participants—including those who endorsed the belief in the “intrinsic” pathway, that is that their fears were a part of their temperament—believed that their contamination fear was present from birth. In fact, all interviewees could recall a time before their fear onset when they were symptom free, with fear onset being reported as between 5.5 and 36 years of age. Stressors and traumatic life experiences which did not involve a contaminant and which did not give rise to subsequent feelings of contamination but which were believed to have influenced fear onset were also reported by participants. Participants reported they believed that these factors made them vulnerable to fear and/or OCD, but may that there was a discrete precipitating factor (trigger) responsible for their symptoms. This finding reflects stress theories which propose that when stress precedes or coincides with aversive events this can significantly increase fear development (e.g. Shors, 2006).

For some participants the pathway question was not a straightforward case of cause-effect, as two pathways were often reported to be important or intertwined. A combination of multiple pathways has in previous studies been thought to be the most common route to fear onset (e.g. Merckelbach et al., 1989; Ollendick & King, 1991). It has also been found that other factors such as depression can facilitate associative learning (Jones & Menzies, 1998). This may in part account for the inconsistency between results of the current study and those of Jones and Menzies (1998) and Krochmalik and colleagues (2007); the higher incidence of learning accounts found in the current research could be due to differences in co-morbidity of depression at the time of symptom onset. While it is unknown whether and how many of the interviewees in this study were experiencing depression at the time of their fear onset, given the number and types of stressful events experienced there may be a relatively high

proportion of such a combination. At the time of the interview a large proportion (40.0%)² of participants met diagnostic criteria for depression but it is unknown if depression preceded or followed OCD onset.

This study relies on retrospective accounts for learning episodes and life stressors at the time of or prior to contamination fear onset. Participants were asked to recall events which had occurred much earlier in their lives and ascribe fear onset to a causal pathway on average 19 years after their fear development. A few participants could not remember any negative events before the start of their contamination subtype and it is unknown whether they were not subjected to any such experiences or if they could simply not recall any at the time of the interview. Furthermore, retrospective studies are commonly criticised (cf. Field et al., 2001; King et al., 1998; Mineka & Öhman, 2002) as it has been argued retrospective recall is commonly unreliable (Mineka & Öhman, 2002) and causal attributions may be inaccurate (Taylor, Deane & Podd, 1999; Withers & Deane, 1995). The biases of retrospective recall may have led participants to underestimate the role of learning and overvalue the non-associative categories for their respective fears (King et al., 1998; Merckelbach et al., 1996). The majority of participants did, however, report prior events and many recounted direct, vicarious and informational experiences in great detail. Retrospective accounts can be accurate (Brewin, Andrews, & Gotlib, 1993; Kheriaty, Kleinknecht & Hyman, 1999) and memories may be strongest when they involve events which are surprising or unanticipated, unique, consequential and emotion-evoking (Linton, 1979; Rubin & Kozin, 1984). Most of the accounts provided by the sample fit this description. The intensity of some of these experiences was reflected in people's reactions upon recalling the event; not infrequently participants acted embarrassed, anxious, angry, and disgusted. For example, on one occasion evoking a particular past experience caused one participant to gag despite the event occurring over four decades earlier. Furthermore, recalling past events led to the sense of being re-contaminated for some.

The interview designed for the purpose of this study was aimed to be thorough and to give equal weight to each of the aetiological pathways under investigation. Interviews can be more reliable than questionnaires (e.g. Kheriaty et al., 1999), but the reliability and validity of the Origins Interview is unknown. Furthermore, there is some evidence to suggest the pathways to

² This proportion cannot be compared with participants in Jones & Menzies' (1998) and Krochmalik and colleagues' (2007) studies as a) these researchers assessed for depressed mood rather than major depressive disorder, and b) depressed mood was only assessed in those who reported learning events in their sample.

which people ascribe their fears may change over time (Taylor, Deane, & Podd, 1999) and in this study the stability of participants' attributions at multiple time points was not tested. Furthermore, the relationship between the onset of contamination fears and other OCD symptoms which may have been of equal or primary importance was not assessed.

Despite these limitations, the study had important strengths including a diagnostic evaluation (ADIS-IV) and careful separation of mental contamination, contact contamination and morphing fears. This study provides the first evidence for a separate onset of the contamination subtypes, both in terms of the age of onset as well as in their aetiology in patients who have both mental and contact contamination. It also highlights the role of associative learning in the acquisition of mental contamination. It is suggested that such information has important treatment implications, in particular with developing a longitudinal formulation within therapy. It can also be used as part of psychoeducation to help patients understand that they are not 'mad, bad or dangerous' which are common appraisals associated with OCD but instead there is a rational explanation for their irrational fears. Such information also has the potential to help provide a rationale for the potential effectiveness of existing cognitive behavioural interventions based on learning models (Craske et al., 2014) and help engage patients in the treatment.

The research on mental contamination is in its infancy. The construct has sparked a great deal of interest due to its clinical relevance, and its potential in helping understand and overcome the challenges presented by forms of OCD that do not readily respond to standard exposure and response prevention strategies. In conclusion, this small study provides some important indications as to the onset of mental contamination and its relationship with contact contamination in terms of aetiology and age of onset but further work on their common and distinct maintaining mechanisms is required to ensure the development of efficient, efficacious and accessible interventions.

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Table 1 Characteristics of each of the groups identified in this study.

	% female	Mean Age (SD)	YBOCS Mean (SD)	OCI-R Mean (SD)	VOCI-MC Mean (SD)	MFQ Mean (SD)
Contact Contamination only	33.3	35.58 (8.35)	23.5 (6.19)	34.25 (8.97)	22.67 (12.5)	5.58 (6.35)
Mental and Contact Contamination	62.5	32.37 (11.26)	27.13 (6.28)	42.69 (11.86)	49.94 (16.41)	13.6 (10.89)
Morphing	83	25.67 (8.48)	24.2 (4.15)	43.83 (11.50)	42.5 (18.76)	19.5 (10.06)
Overall	53	33.07 (10.16)	25.50 (6.27)	40 (11.12)	49.00 (22.93)	14.84 (11.88)

Table note: The Mental and Contact Contamination group contains all those reporting both mental and contact contamination including those who in addition reported morphing fears. The Morphing sample includes all those reporting morphing fears, i.e. those who reported morphing fears and either or both of the other types of contamination concerns

Table 2 Percentage of participants reporting learning experiences, shown by the type and number of types of learning experiences reported

Numbers of types of learning experiences reported	Participants with contact contamination fears (N=29)	Participants with mental contamination fears (N=17)	Participants with morphing fears (N=6)
None	13.8%	23.5%	50.0%
One type only	20.7%	58.8%	16.7%
Two types	31.0%	17.6%	16.7%
All three types	34.5%	0.0%	16.7%
Type of learning experience reported			
Direct	58.6%	76.5%	50.0%
Vicarious	58.6%	0.0%	16.7%
Informational	69.0%	17.6%	16.7%

Table 3 Associative and non-associative experiences reported: mean and total number of events recalled, number of participants reporting the experience, and range of the number of events recalled by each participant

	Direct experiences			Vicarious experiences			Information experiences			Other non-associative experiences		
	Mean no. events recalled (total)	No of ppts reporting event(s)	Range	Mean no. events recalled (total)	No of ppts reporting event(s)	Range	Mean no. events recalled (total)	No of ppts reporting event(s)	Range	Mean no. events recalled	No of ppts reporting event(s)	Range
Contact (N=29)	0.93 (27)	17	0-5	0.86 (25)	17	0-5	1.31 (38)	20	0-5	0.24 (7)	7	0-1
Mental (N=17)	1.35 (23)	13	0-3	0 (0)	n/a	n/a	0.18 (3)	3	0-1	0.06 (1)	1	0-1
Morphing (n=6)	0.67 (4)	3	0-2	0.33 (2)	1	0-2	0.17 (3)	2	0-2	0.33 (2)	1	0-1

Figure 1 Numbers of participants with each constellation of contamination concerns. 40% of the participants reported only contact contamination concerns, 40% reported both contact and mental contamination concerns and 13.3% reported all three types of concern. 3.3% of the sample reported both morphing and mental contamination concerns and 3.3% reported both morphing and contact contamination concerns. (N=30)

